Summary of research needs as identified by WS Eastern and Western Region State Directors, NWRC scientists, and the National Wildlife Services Advisory Committee-2001

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Bird Research

Aquaculture

- Determine the populations and impacts of double-crested cormorants and pelicans on sport fish and other natural resources.
- Implement a strategy for controlling double-crested cormorant populations on breeding grounds to minimize damage to the aquaculture industry.
- Clarify the local movements of American White Pelicans in and around aquaculture facilities as related to their possible transmission of catfish diseases.
- Determine the economic impact and investigate methods to protect freshwater and marine aquaculture from fish eating birds.
- Develop methods to test behavior-contingent disruptive stimulus devices on birds, primarily in aquaculture or crop depredation situations.

Aviation

- Continue to work on solutions to bird and other wildlife problems at airports.
- Continue investigating and developing nonlethal methods (e.g., habitat management techniques and recommendations) to reduce wildlife hazards at airports nationwide.
- Maintain and expand the National Wildlife Strike Database (NWSD).
- Evaluate desert environments as they pertain to wildlife-aviation strike hazards.

Blackbirds/Corvids (crows and ravens)

- Develop new/improve existing methods (e.g., repellents, toxicants, Avitrol, pyrotechnics, harassment, barriers, reproductive inhibition) to mitigate the impact of blackbird, crow, and starling damage to sunflowers, sprouting and ripening rice and corn, other small grain crops, and fruit crops.
- Develop methods to estimate the mortality of blackbirds during operational use of chemical control methods.

  Better understand the roosting preferences and behaviors of urban crows and investigate and develop aversive methods to manage urban/suburban bird roosts involving crows, starlings, grackles, pigeons, cowbirds and blackbirds.
- Develop repellents for ravens and crows.

Waterfowl/Gulls/Terns

- Evaluate the effectiveness of existing and new tools (e.g., lasers, collies, and habitat management) for waterfowl (i.e., geese and ducks) and develop other more efficient, long lasting methods to address issues associated with human health and safety, agriculture, urban property (landscapes, rooftops and landfills), and natural resources (shoreline erosion from overgrazing).
- Determine the severity of and develop methods to reduce the impacts to winter wheat and other crops by grazing waterfowl, especially Canada geese.
- Evaluate the effectiveness of relocating urban/suburban Canada geese and determine their survival and return rate.
- Develop and evaluate methods to manage gull and tern populations causing problems to endangered salmon species at hydroelectric structures.

Other Birds/Situations

- Evaluate repellents for parrots and cardinals in seed corn on Hawaii/Pacific Islands.
- Develop methods to manage damage by birds to vineyards.
- Develop tools to manage woodpecker damage to structures, utility poles, and citrus, and raven damage to citrus.
- Develop methods (e.g., lasers and infrared technologies) to reduce eagle predation on livestock.
- Continue to develop methods to disperse black and turkey vulture roosts and manage their damage to livestock, property, communication towers, homes, and water craft.
- Develop a decision model as a tool to decide if depopulating vulture roosts is economically feasible.
- Increase activities related to the protection of neotropical songbirds from competition with blackbirds and other overabundant and nuisance wild and feral domestic animals.
- Conduct applied research that investigates the important factors influencing aversions (e.g., flavors and social facilitation) on birds.

- Evaluate the impact on birds of chemicals used for insect control

Mammal ResearchB

Aquatic Mammals

- Evaluate beaver populations and develop existing (e.g., repellents, barriers) and alternative (e.g., relocation) management practices to reduce their damage to timber, crops, roadways, railroads, housing developments nationwide.
- Determine the role of beaver populations in salmon ecology and develop management methods.
- Conduct research to identify, evaluate, and improve the methods, materials and devices needed to reduce and monitor nutria and muskrat damage to marsh ecosystems and agriculture, including developing ecologically sound and cost effective integrated management strategies.

Forest Resources

- Continue to develop alternative methods and strategies to protect timber and forest resources from wildlife damage nationwide.
- Determine whether bear damage to timber is a learned behavior or an evolutionary trait.
- Improve technology used in non lethal wildlife relocation efforts (e.g., bears) related to method of capture and transport, distance, time-of-day, habitat, and territorial insertion.
- Develop effective, environmentally safe toxicants and delivery systems for forest mammal damage management

Predators (Livestock)

- Develop predator management programs that include state-of-the-art technology and cutting edge science.
- Assess strategies and programs and develop methods to manage coyote predation on livestock.
- Evaluate sheep losses to coyotes in areas with and without operational control.
- Develop both non lethal and lethal tools to selectively target and remove specific predators whose territories overlap sheep pastures in an economic, efficient, and humane manner.
- Develop lethal or non lethal control methods that are effective against territorial, dominant coyotes (alphas) who have previously been exposed to control.
- Continue to develop alternative predator capture devices, with a focus on decreasing injury rates.
- Develop new, effective, non-lethal capture techniques and management strategies for predators (e.g., coyotes, wolves, fox, bear and mountain lions).
- Re-evaluate the capture efficiency and non-target impacts of the foothold traps and snares currently being used to capture coyotes, foxes, and raccoons.
- Develop new technologies to address 24 hour trap check requirements
- Develop live traps for larger mammals such as coyotes, lions, and bobcats.
- Develop techniques for remote triggering of coyote calling devices.
- Develop new predator management tools to replace traps and toxicants on public lands.
- Evaluate damage management methods for established wolf populations.
- Determine the population dynamics of expanding cougar populations.

Rodents

- Continue development of tools and techniques for use in integrated pest management strategies for ground squirrels, prairie dogs, pocket gophers, voles, and deer mice.
- Develop toxicants, chemical and physical repellents to prevent gnawing, contamination, structural damage, and crop/food loss damage by rodents.
- Develop and refine ecologically sound and cost-effective techniques for rodent control in agriculture and native ecosystems in Hawaii and islands in the Pacific, Indian, and Caribbean Oceans.

Other Mammals/Situations

- Conduct applied research that investigates plant-herbivore interactions, that is the natural defenses of plants to wildlife.
- Develop non lethal methods to reduce ungulate deer and elk damage in agricultural and urban landscapes.
- Conduct research to determine the population, range, density of the nine-banded armadillo in Florida, quantify their ecological and economic impacts and identify, evaluate, and improve methods to reduce its damage to ecosystems and agriculture.
- Conduct research to determine the population size, range, density of wild pigs throughout their range in the US, quantify their ecological/economic impacts, evaluate, and improve the methods to reduce and monitor pig damage to ecosystems and agriculture.

Threatened and Endangered Species

- Develop methods to detect and manage the impact of mammalian predators on T&E wildlife species, specifically red fox predation on rails and terns, and rat, feral cat and island fox predation on shrikes.
- Examine the growing conflict and develop basic and applied strategies to reduce mammalian predation on threatened and endangered species.
- Develop new, effective and efficient methods and assess management strategies to reduce risks that predators (e.g., coyotes, wolves) pose to threatened and endangered species.
- Determine the indirect benefits to pronghorn fawn survival rates of predator management programs.
- Evaluate all impacts, including the incidental or coordinated beneficial impacts on native prey, from the use of integrated wildlife damage management techniques.

Invasive Species

- Begin to document the extent of invasive vertebrate species nationwide, beginning within each state, and initiate research into invasive species management in the U.S.
- Develop options for managing invasive and exotic species problems in the U.S.
- Develop and refine control techniques for the Brown Treesnake on Guam, including effective aerial bait delivery systems and artificial attractants.
- Evaluate the efficiency of canines to detect Brown Treesnakes under the current passive detection protocol on Guam.
- Develop methods to monitor and control introduced vertebrate species that have impacted Hawaiian agriculture and natural resources, including tree frogs, parrots, axis deer and small predators.
- Develop crab/pig resistant bait stations for anticoagulant use on rats and mongoose in island environments.

Chemical Products and Registration

- Continue to assure use and improvement of existing tools and chemical products.
- Develop an alternative chemical and delivery system to the M-44.
- Evaluate registration of M-44 for protection of natural resources (mammalian and avian).
- Develop odor and taste attractants to improve rodenticide, avicide, and contraceptive baiting efficacy, safety and selectivity toward target species.
- Evaluate registration of DRC-1339 for use in protecting bee boards from corvids (magpies, crows, ravens).
- Develop a replacement avicide for DRC-1339.
- Determine the adsorption, distribution, metabolism, and excretion of alpha chloralose in target pest bird species related to the 30 day FDA-imposed hunting moratorium on its use.
- Conduct research to develop more bird repellent and toxicant registrations.
- Develop effective microencapsulation techniques for rodenticides.
- Develop a more effective tranquilizer trap device for expanded widespread use to include wolves and feral dogs.

- Develop effective baits to live trap armadillos in urban areas.
- Develop an improved bait for use in removing starlings and blackbirds from feedlots, dairies, and staging areas.
- Identify and evaluate alternative products, such as repellents, attractants, and/or animal drugs for possible registration with EPA and FDA.
- Develop new ways to formulate and deliver products more efficiently for use by wildlife damage managers.
- Develop a nontoxic, cost-effective blackbird repellent for protecting rice crops.
- Explore and develop genetic plant and prey species alteration as a means of reducing the attractiveness of crop and livestock resources to problem wildlife
- Register ROZOL grain-bait for prairie dog control

Wildlife Disease

- Evaluate the significance of and develop methods to reduce the risk of disease transmission by crows, starlings, geese, and other avian wildlife to humans and livestock.
- Determine the impact of and develop methods to reduce human health and safety impacts caused by waterfowl, especially Canada geese, in urban/suburban areas.
- Increase research on reproductive inhibitors and oral vaccines for wildlife disease control.
- Evaluate the relevant aspects of demography, behavior, and movements of raccoons as they relate to oral rabies vaccination programs.
- Develop methods to manage the impact of rabies and other diseases transmissible from wildlife to humans.
- Obtain information on gray fox home range and population dynamics to develop improved oral rabies vaccine baiting strategies.
- Develop methods to survey and monitor emerging wildlife diseases that pose potential threats to human health and safety.

Wildlife Population - models/census/economics

- Continue research on impacts and efficacy of predator control, including cost:benefit analyses and intra- and inter-species impacts nationwide.
- Continue to develop methods to census wildlife populations (e.g., coyotes, foxes, feral hogs, armadillos, and raccoons) related to increased ability to implement and improve control programs to protect threatened and endangered species.
- Develop a standardized survey to assess the distribution, magnitude, and characteristics of wildlife damage problems associated with urban/suburban areas.
- Develop methods to census and investigate populations of problem wildlife species (e.g., coyote, beaver, bear, mountain lions. blackbirds, gulls, cormorants, and geese) related to management and NEPA requirements.
- Develop methods to monitor pest wildlife populations related to economic impacts, management effectiveness, and environmental concerns
- Develop methods that the WS program can use to report the estimated “take” associated with different damage control measures.
- Develop quantitative and economic evaluations of current applied wildlife damage methods and tools (e.g., aerial hunting) under operational circumstances.
- Develop a better understanding of population dynamics and economic impact of the primary species to which WS directs its operational programs.
- Devise computer-based techniques to evaluate the costs:benefits of preventative and corrective approaches, tools, and activities associated with the species most frequently managed by WS and its stakeholders.
- Develop bioenergetic models to estimate economic impacts of blackbirds and other overabundant and nuisance species relative to cost:benefit analyses, management programs, and environmental issues.
- Improve the understanding of carnivore depredations through modeling and develop new and modified management strategies.
- Develop genetic markers for use in censuring populations and identifying individual animals for improved management of pest wildlife.
- Conduct economic analyses of the 1) value of wildlife to non-consumptive users, 2) livestock losses vs control implementation by WS operations, 3) impacts of lethal control on ecosystem health and integrity, and 4) aerial gunning program of WS operations.

Documentation/Information

- Index APHIS/WS/NWRC website to "hit" for searching by species (e.g. coyotes, gulls, etc.)
- Assemble a product-specific database of commercial wildlife repellents, with relevant research citations, as an aid to wildlife managers nationwide.
- Conduct human dimension research to assess the impact of wildlife damage management programs on the public.

- Evaluate public attitudes toward Wildlife Services and study the effects of the WS national education program on attitudes towards wildlife-human conflicts.
- Assess potential wildlife "growth" areas to determine the need and extent of emerging wildlife damage issues.
- Document calf losses to natural causes versus coyote predation.
- Document the benefits of predator control to enhance wildlife populations.
- Communicate new research developments more effectively, by improving technical and educational outreach program and information transfer between research and operations.